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Research Support to Implement the President's Forest Plan

'94 ACCOMPLISHMENT HIGHLIGHTS

Produced by the USDA Forest Service Pacific Northwest and Pacific Southwest Research Stations

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Forward

We are pleased to share this report on the actions and contributions of Forest Service Research in 1994 to the implementation of the President's Forest Plan in Washington, Oregon, and Northern California.

This year, managers and scientists in the Pacific Northwest (PNW) Research Station in Portland, Oregon and the Pacific Southwest Research Station (PSW) in Berkeley, California worked diligently with interested public groups and the land-management organizations of the region to strengthen working relations and participation in initiating implementation of the President's Plan. There were many rewards, and some significant frustrations. Rewards came from new and strengthened partnerships. Agencies, members of the public, and scientists are working together today to share information, resources, and actions in ways that were not even considered in the past; these working relationships are critical to effective, scientifically-based, cross-region ecosystem management. Frustrations come from the excitement of recognizing the value of these newly developed working relations, and the slowness at which real change comes.

Significant progress has been made toward implementing interagency, collaborative ecosystem management across political and geographic boundaries. We have established strong working relationships with interagency groups such as the Regional Ecosystem Office (REO), the Regional Interagency Executive Committee (RIEC), the Research and Monitoring Committee (R&M), and the Interagency Resource Information Coordinating Council (IRICC). These are only samples of the outreach and coordination efforts going on within the PNW and PSW Research Stations.

In addition to funding specifically designated for implementation of the President's Plan, both stations redirected a total of $1.5 mm to the effort

We highlight some of our activities in 1994 in the following material. We are pleased with our accomplishments this year, and are very excited about the prospects for building on this foundation in 1995.

Charlie Philpot
Director, PNW Research Station
Portland, Oregon

James Space
Director, PSW Research Station
Berkeley, California

History of the Program

For more than two decades there has been a growing controversy over the management of old-growth forests on federal lands. The Pacific Northwest, specifically the range of the northern spotted owl, lie at the center of that controversy.

The result has been described as a gridlock of lawsuits, court rulings, appeals, injunctions and protests. The public debate has expanded from management of northern spotted owl habitat to include management of all old-growth forest associated species and old-growth ecosystems.

In July 1992, the Forest Service was required by the U.S. District Court for the western district of Washington to prepare a new or supplemental environmental impact statement (EIS) to correct deficiencies found in the 1992 "Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests." The BLM was required by the U.S. District Court for the district of Oregon to prepare an EIS to incorporate new information on the effects of logging on the northern spotted owl, and to consult on a conservation strategy. Both agencies were enjoined from selling timber in northern spotted owl habitat pending completion of these supplementary environmental analyses.

In an effort to find common ground and craft a workable solution to the controversy, President Clinton held a forest conference in Portland, Oregon, on April 2, 1993. During the day-long conference, scientists, economists, representatives from the forest products industry, environmental groups, Indian tribes, and others presented a wide range of concerns and proposals to the President.

FEMAT

After the forest conference, a forest ecosystem management assessment team (FEMAT) was assembled to explore options for an ecosystem approach to forest management in the region. FEMAT members developed and presented ten options in their report, *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment* (The FEMAT Report).

Using the FEMAT Report, an interdisciplinary team prepared a supplementary environmental impact statement (SEIS) with the assessment team's ten options as alternatives. Alternative 9 (option 9 in the FEMAT Report) was the alternative selected by the Secretaries of Agriculture and Interior who signed the joint Record of Decision (ROD) that accompanied the SEIS. Included in the ROD are extensive descriptions of new land allocations and standards and guidelines for managing resources within the allocations. The intent of the allocations and their accompanying direction is to preserve and enhance late-successional and old-growth forests and aquatic resources while providing for economic development opportunities for communities traditionally dependent on timber extraction. These were the goals expressed by President Clinton at the Portland forest conference

JOINT PNW/PSW PLAN

Looking ahead, both the PNW and PSW Research Stations realized that long-term benefits would result from working together to develop ecosystem management strategies and protocols. A joint PNW/PSW plan was prepared and signed by the station directors and Region 5 and 6 regional foresters. This document will be a vehicle for Forest Service research stations and regions to move towards implementing ecosystem management in the Pacific Northwest. In addition, it can be used as a model for ecosystem management in other regions.

FUNDING

In FY 1994, a total of $5.7 million was made available for research to support implementation of ecosystem management in the Pacific Northwest. The primary sources of these funds were timber salvage sale trust funds (as mandated by Congress) and redirections from the National Forest System in regions 5 and 6. The funds were allocated by the Forest Service to the PNW Research Station, with reallocation to the PSW Research Station according to research support activities outlined in this document. Funds were distributed to the two stations by the FEMAT budget components as shown in the following table.

PSW and PNW Research Stations Ecosystem Management Fund Distribution FY 1994

FEMAT BUDGET COMPONENT	PSW (shown in $1000s)	PNW (shown in $1000s)
WATERSHED ANALYSIS	$380	$2520
ADAPTIVE MANAGEMENT AREAS	250	750
ECOSYSTEM RESTORATION	0	0
PLANNING AND MONITORING	450	1350
RESEARCH	0	0
TOTAL PROGRAM:	**$1080**	**$4620**

Note: This table shows the breakdown of funds by program components as allocated by the Washington Office to the stations. The stations chose to reallocate some of these funds to ecosystem restoration and research.

Five components were assigned for implementation and management of the President's Forest Plan. These components were designated based on critical work that needs to be addressed by researchers and land managers.

Philosophy of the Program

Federal land management and regulatory agencies are committed to developing a biologically, socially, and legally acceptable strategy for allocating and managing federal lands in northern California, western Oregon, and western Washington. The foundation of this strategy is ecosystem management based on the best scientific information available, collective judgment, and assessment of social and economic values.

The role of the PNW and PSW Research Stations is to develop and provide the knowledge needed for environmentally sound management of the complex and varied ecological systems within the range of the northern spotted owl. Our objectives are to ensure the long-term biological integrity of ecosystems, the sustainable production of resource values, and to develop an adaptive approach to ecosystem management that is responsive to changing knowledge, changing environmental conditions, and changing public needs.

Within the framework of ecosystem management, the role of research organizations has expanded. In addition to the more traditional role of providing basic research, scientists are expected to be involved in all phases of adaptive management—including planning, evaluating, and supporting functions such as inventory and monitoring. Ecosystem management also requires close coordination among research organizations. More than ever, it is critical that organizations such as Forest Service Research address the needs of all clients—federal and state, public and private.

Programs to achieve the above objectives have been carried out based on the following guiding principles:

- collaboration
- inclusion of interests
- integration
- mutual learning
- linkage to science
- commitment
- accountability
- meeting expectations
- creativity
- documentation
- responsiveness.

The Vision

Research support for implementing ecosystem management includes both a short-term strategy for providing technical support and developing the techniques immediately needed by land managers, and a plan to improve understanding of ecosystem and social functions to carry out a longer-term vision. Examples of anticipated short and long term research support activities are summarized below.

Short-Term Plans Include:

- Assist with the watershed analysis process to custom build riparian and stream management and protection plans
- Assist in the interpretation of standards and guides, and other direction selected for implementation
- Provide scientific assessment of proposed actions
- Assist in developing multi-agency management, planning, and information systems
- Assist in developing adaptive management practices and similar innovative alternatives to traditional resource management activities
- Produce research and development plans to address longer-term support needs and fill critical gaps in knowledge.

Longer-Term Activities Include:

- Implement effective adaptive management strategies that are based on actions that incorporate and link new knowledge, involve monitoring, and include continuous evaluation and modification
- Expand values and benefits to society while meeting legal, economic, social, and biological requirements
- Develop more appropriate and effective mechanisms that allow all segments of society to become directly involved in resource planning, management, and decision-making;
- Fill critical gaps in knowledge
- Restore damaged ecosystems and ecosystem components
- Establish regional information systems, data bases, and evaluation tools for regional-level analyses.

Framework of the Program

Five components were assigned for implementation of the President's Forest Plan. These components reflect the philosophy and vision set forth for the program as well as priorities for implementing ecosystem management and research programs throughout the region.

Provide for Watershed Analysis

Watershed analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is an important analytical step supporting ecosystem planning for watersheds of approximately 20 to 200 square miles. Moreover, it is a key component of integrating social expectations and the biophysical capabilities of specific landscapes.

Information gathered will support implementation of management prescriptions, including setting and refining boundaries of riparian reserves and other allocated reserves, developing restoration strategies and priorities, and revealing the most useful indicators for monitoring environmental changes.

The results of watershed analyses may include: a description of resource needs, capabilities, and opportunities; a description of the range of natural variability within a watershed; spatially explicit information that will facilitate environmental and cumulative effects analyses for NEPA; and information about the processes and functions operating within the watershed. Watershed analysis also will identify potentially disjunct approaches and conflicting objectives within watersheds. Information gathered will be used to develop priorities for funding and project implementation as well as development of monitoring strategies and objectives. The participation of adjacent landowners, private citizens, interest groups, industry, various government agencies, and others in watershed analyses will be encouraged.

Provide Research Support for Adaptive Management Areas

Adaptive management areas (AMAs) are landscape units designed to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. Ten areas ranging in size from approximately 92,000 acres to nearly 500,000 acres of federal lands have been identified. The areas are well distributed in the physiographic provinces. Most are associated with subregions impacted by reduced timber harvests from federal lands. The areas provide a diversity of biological challenges, intermixed land ownerships, natural resource objectives, and social contexts.

The overall objective for adaptive management areas is to learn how to manage on an ecosystem basis in terms of both technical and social challenges, and in a manner consistent with applicable laws. It is hoped that localized idiosyncratic approaches that may achieve the conservation objec-

tives of these standards and guidelines can be pursued. These approaches rely on the experience and ingenuity of resource managers and communities rather that traditionally derived and tightly prescriptive approaches that are generally applied in forest management.

Research will focus on efforts to: 1) integrate planning, management, and research in AMAs; 2) assess and evaluate results of management and RD&A activities; 3) facilitate public participation in adaptive management activities.

Facilitate Ecosystem Restoration

Many ecosystems have undergone alterations to the extent that they no longer support important values. Examples include: 1) streams that have severely degraded habitat for anadromous fish; 2) forests that are fragmented to the point that some wildlife an plant species are disappearing; 3) unacceptable production of sediments from deteriorating or poorly designed road systems; 4) inadequate amounts of contiguous old-growth forests to fully support a late-successional forest system; 5) modification of species occurrence, stand structure, and forest conditions because of fire exclusion; and 6) introduction of exotic plant and animal species. Hence, there is a need to increase efforts to restore these segments of forest ecosystems in order to improve their capability to provide desired conditions.

The President's Plan focuses restoration efforts at the watershed level. Watershed restoration is a comprehensive, long-term program to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms. Watershed restoration will be an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. The most important components of a watershed restoration program are control and prevention of road-related runoff and sediment production, restoration of riparian vegetation, and restoration of in-stream habitat complexity. Other restoration opportunities may exist such as meadow and wetland restoration and mine reclamation. Restoration efforts will be based on watershed analysis and planning. Research supports the restoration program by assisting managers to: 1) develop methods and protocols to assess restoration needs; 2) provide technical support of restoration activities; and 3) design methods to evaluate the effects of restoration strategies.

Develop Research Support for Planning and Monitoring

The objective of this component is to design and develop new planning tools and management processes to support an adaptive approach to ecosystem management. Research will also help managers define monitoring needs and design and evaluate regional monitoring strategies.

Monitoring is an essential component of natural resource management because it provides information on the relative success of management strategies. The implementation of the President's Plan will be monitored to ensure that management actions are meeting the objectives of the prescribed standards and guidelines, and that they comply with laws and management policy. Monitoring will provide information to determine if the standards and guidelines are being followed (implementation monitoring), verify if they are achieving the desired results (effectiveness monitoring), and determine if underlying assumptions are sound (validation monitoring). Some effectiveness, and most validation monitoring will be accomplished by formal research.

Adaptive management is based on monitoring that is sufficiently sensitive to detect relevant ecological changes. In addition, the success of adaptive management depends on the accuracy and credibility of information obtained through inventories and monitoring.

Research and Development to Expand the Scientific Basis for Ecosystem Management

Over the long-run, ecosystem management will fail or succeed based on its foundation of advanced scientific knowledge and understanding of forest ecosystems. Fundamental research will pro-

vide information about ecosystems and social and economic processes and interactions to ensure that management programs are as effective and efficient as possible.

Close coordination between monitoring and research are essential to the success of adaptive management processes. Data obtained through systematic and statistically valid monitoring can be used by scientists to develop research hypotheses related to priority issues. Conversely, the results obtained through research can be used to further refine the protocols and strategies used to monitor and evaluate the effectiveness of these standards.

Research and development are concentrated in three areas: 1) Developing a fundamental understanding of ecosystems to sustain ecosystems, protect habitat, and provide multiple forest values. Present knowledge will provide the foundation for planning ecosystem management research that will address relevant future issues. 2) Evaluating alternative adaptive management strategies. Management decisions, by necessity, must be based on incomplete knowledge and assumptions that have not been fully tested. Research will be done to assess the validity of these underlying assumptions, to evaluate the ecological consequences of alternative management strategies and techniques, and to identify new and better options. 3) Research and development to improve understanding of societal values, desires, and needs related to cultural and natural resources.

PROGRAM HIGHLIGHTS

Watershed Analysis

In FY 1994, PNW and PSW scientists contributed to the following activities:

Technical assistance to land managers

- The Humbolt Interagency Watershed Analysis Center in McKinleyville, California was developed as a cooperative venture between the PSW Research Station, Six-Rivers National Forest, the National Park Service, the Bureau of Land Management, the National Marine Fisheries Service, and the Fish and Wildlife Service. This interagency center provides a node for expertise in watershed and ecological sciences. Researchers have provided scientific leadership in the design of the center, and the development of watershed analysis procedures.

- Station scientists participated in an Interagency Watershed Analysis Coordination Team. This team, organized by the Regional Ecosystem Office, has developed regional guidelines for watershed assessment.

- To help ensure consistency in aquatic protection on federal lands, station scientists developed a document to compare FEMAT with PACFISH and 5 other proposed and implemented aquatic conservation strategies.

- Scientists consulted with the regional coordination team, pilot, and other watershed analysis teams on a variety of topics, including disturbance regime analysis, analysis of road systems and their effects, and erosion rates.

- Station scientists participated in developing 3 pilot watershed analyses in 1994, and provided scientific consultation on several others in progress.

- Technical support for watershed restoration efforts within the range of the northern spotted owl was provided by researchers who prepared study plans to analyze riparian silviculture practices currently being conducted by federal land management agencies.

- A draft guide for agency personnel to use when conducting watershed analyses was produced by station scientists.

Technology development

- As part of the development of an aquatic conservation strategy, scientists assessed how different designs for riparian reserves influence the channels that they were designed to protect.

- A computer program to derive flow paths and watershed boundaries from digital elevation models (known as DEMON: Digital Elevation Model Networks) was developed in cooperation with researchers at the University of Washington. Once completed, this model will provide for more accurate determination of stream locations and watershed boundaries.

- In cooperation with the Bureau of Land Management and the Mattole Restoration Council, station scientists are working to characterize intermittent streams and quantify their importance to fish, amphibians, and reptiles in the Mattole River Basin

- Working with the National Park Service, station scientists assessed variations in fish populations and food resources among tributaries in the Redwood Creek Basin in order to identify and describe links between biological variables and barriers for anadromous fish passage.

- Forest Service scientists contributed to the aquatic and terrestrial components of a watershed analysis for Pilot Creek on the Six Rivers National Forest by developing habitat relationship models for selected herpetofauna.

- As part of a major effort to evaluate the importance of nonfederal lands in supporting viable, well-distributed populations of northern spotted owls on Washington's Olympic Peninsula, station scientists took the lead role in preparing a report summarizing results of a simulation analysis of spotted owl populations in relation to forest management activities.

- Station scientists initiated a study to examine the ecological importance of amphibians in headwater streams, stream banks, upslope draws, and other upslope areas. A component of this study addresses fish surveys in the headwater streams that complement amphibian surveys. It also assesses the impacts on fish and amphibians of upslope thinning regimes in 50-year old naturally regenerated stands.

- As part of an interagency team, Forest Service scientists helped to evaluate the impacts on aquatic systems of sold and awarded timber sales on BLM and USFS lands.

- Forest Service scientists have developed a project to characterize ecosystem processes watershed and basin scales, explore the linkages between the two scales, and investigate how they affect native and introduced fish populations in the Eel River Drainage.

- Researchers have developed survey protocols for forest carnivores and bats. These protocols are necessary to evaluate the presence and status of these animals as a part of a watershed analysis process.

Training

- Station scientists planned and coordinated a variety of topical workshops held at the Interagency Watershed Analysis Center.

- Forest Service scientists have conducted workshops, training sessions, field reviews, and briefings on the concepts and practices of watershed analysis. Several demonstration watersheds were identified and developed including the Augusta Project, an analysis of a 19,000 acre watershed in the Willamette National Forest that will be a prototype for landscape-scale ecosystem management.

- Station scientists helped develop the social and economic modules of a Watershed Analysis Handbook.

Adaptive Management Areas

In FY 1994, PNW and PSW scientists contributed to the following activities:

Integrating planning, management, & research in adaptive management areas

- Forest Service scientists are developing an interdisciplinary ecosystem research project on the Hayfork Adaptive Management Area. The project seeks to improve our understanding of relationships between physical, social, and biological aspects of ecosystems and ecosystem management, at a variety of scales, through time.

- A study of the history, distribution, and pattern of fire is being planned in the Hayfork Adaptive Management Area

- The Applegate and Cascade adaptive management areas were selected as pilot areas for science involvement. Numerous projects are now focusing on those areas. Examples of products from this effort are:
  - Developed the first "umbrella" science plan for the Applegate AMA
  - Initiated 4 major science studies to test FEMAT assumptions
  - Planned and implemented 4 public forums on AMA processes for Cascade AMA

- Station researchers completed work on a conceptual framework for the adaptive management process. They then developed a case study in Southeastern Alaska to illustrate how the framework might be used on the ground.

- A core research team was established to help coordinate scientific and technical assistance to support management activities in adaptive management areas.

- The Olympic Adaptive Management Area was indirectly supported by three major research projects on Washington's Olympic Peninsula: 1) The Washington Landscape Study, which is in its second year of funding, includes a portion of the Olympic AMA. 2) The University of Washington is supported by the PNW Station on a landscape modeling system which is using a portion of the Olympic AMA as a test site. 3) The Spotted Owl Demographics Study is looking at long-term monitoring of Olympic spotted owls. In addition to these projects, AMA funding for FY1994 supported the Olympic Learning Center Director who has been integral to the development of the Olympic AMA.

- Over 20 papers were given by PNW and PSW station scientists; 8 papers are already in publication.

Assessing and evaluating results of management and RD&A activities

- Scientists at Lewis and Clark College in Portland, Oregon described and evaluated the Applegate partnership in southern Oregon and the Blue Mountains Institute in LaGrande, Oregon as examples of how to develop adaptive management areas. Their efforts were funded by the PNW Research Station.

- Station scientists developed and implemented a study in the Hayfork AMA to evaluate silvicultural treatments designed to foster late-successional forest characteristics as an enhancement of habitat conditions for fishers and their prey.

- A PSW station-wide meeting was held in Hayfork, California to orient scientists to the research opportunities in the Hayfork Adaptive Management Area as well as management concerns of local citizens and the national forest. Planning is underway for a large-scale interdisciplinary study which will include testing ecosystem responses to partial harvests and fuel reduction treatments.

Facilitating public participation in adaptive management activities

- Station scientists organized and participated in a variety of meetings with community and land management groups to develop methods to gain meaningful public input on forest management issues in adaptive management areas as well as on the Hayfork interdisciplinary research project.

- A stand and landscape visualization system was designed to help the public visualize landscape treatments under different ecosystems management options.
- A major workshop was held to bring together all players in the 10 adaptive management areas in the region. In addition to this workshop, over a dozen other workshops on AMA implementation involved Forest Service scientists. Scientists also were involved in several field sessions focusing on reviewing AMA needs

- A cooperative agreement was completed this year with the University of Michigan, The result is a report entitled *Building Bridges Across Agency Boundaries.* This report outlines the components of successful government-community working relationships, barriers to such relationships, and methods to begin building agency "bridges."

- The PNW Research Station initiated a cooperative agreement with the University of Washington Law School to look at legal aspects of implementing ecosystem management. An important component of this work focuses on FACA (the Federal Advisory Committee Act). An understanding of FACA is key to the development of cooperative working relationships across agency boundaries.

- A study was established to look at how communities network when working with government agencies.

Planning & Monitoring

In FY 1994, PNW and PSW scientists contributed to the following activities:

Designing and developing new planning tools and management processes

- SYSTUM-1 is an early seral stand forest growth model. Researchers are working to modify and expand the SYSTUM-1 model to include characteristics of noncommercial woody vegetation. This will enhance its use for assessing long-term effects of silvicultural practices such as uneven-aged management. In addition, a decision support system is being developed for the Klamath Mountains.

Defining monitoring needs and designing and evaluating regional monitoring strategies

- To evaluate inventory and monitoring technology, station scientists are installing permanent monitoring plots on the Drift Creek watershed on the Siuslaw National Forest.

- Scientists have identified sites and begun data collection to assess linkages between sediment storage and movement in stream channels (an increasingly common focus of monitoring by management agencies) and fish and aquatic invertebrate populations

- A project is underway to develop strategies for detecting and monitoring introduced fishes and their effects on native fish.

- Using field surveys, mathematical modeling, and laboratory experimentation, researchers have described a process to monitor movement of sediment through channel systems and its effects on aquatic organisms.

- In cooperation with 3 northern California National Forests, station scientists are working to validate landbird demographic and habitat relationship assessment methods on a watershed basis. Monitoring stations have been established in the Hayfork and Goosenest AMAs.

- Work on a comprehensive review of the literature and experience in the area of social monitoring needs is underway.

- Social science researchers are conducting an assessment of social monitoring needs, including development of a system to monitor public involvement in planning and implementing ecosystem management national forests in the Pacific Northwest.

- Station scientists are developing a problem analysis focusing on integrating social and economic dimensions into resource planning and ecosystem management

Ecosystem Restoration

In FY 1994, PNW and PSW scientists contributed to the following activities:

Developing methods and protocols to assess restoration needs

- Researchers are working on the Eel River to measure the effects of the introduced Sacramento squawfish on native fish assemblages, especially steelhead populations.

Providing technical support of restoration activities

- As part of their work on a Watershed Analysis Guide, station scientists attended meetings, visited six pilot watershed analysis teams, and formed a socioeconomics module design team.

Designing methods to evaluating the effects of restoration strategies

- Researchers and managers are working cooperatively on the Umpqua National Forest to:
  - develop a problem analysis addressing theoretical and practical issues in watershed restoration
  - initiate a preliminary design for evaluation of current restorative activities
  - implement a preliminary monitoring plan.

Research

In FY 1994, PNW and PSW scientists contributed to the following activities:

Understanding ecosystems

- Research is being conducted to describe critical relationships between sedimentation in streams, food resource availability, salmonid population density, and fish growth-rate.

- In cooperation with the Bureau of Land Management and the Mattole Restoration Council, researchers are working to quantify fish and aquatic herpetofaunal distributions and abundances in relation to physical stream processes at the watershed scale in a sensitive watershed.

- Studies have been initiated which focus on sediment input and movement in streams and their impacts on fishes and aquatic invertebrates.

- Station scientists have initiated a study to evaluate annual variation in marbled murrelet productivity and detection levels in California and the implications for determining population status, trends, and habitat use.

Evaluating alternative strategies

- Young stand thinning and diversity studies are being conducted on the Willamette and Olympic National Forests. These studies focus on the use of commercial thinning and alternative silvicultural designs to provide different mixes of biodiversity values and wood product yield.

- D.E.M.O. (demonstration of ecosystem management options) is a major long-term, large-scale research project designed to determine ecological, social, and economic effects of different stand-level treatments being proposed under ecosystem management. To this end, researchers are establishing six treatments that are replicated four times each on the Gifford Pinchot National Forest and the Umqua National Forest. These treatments will cover over 2,000 acres.

Integrating economic and social dimensions of forest ecosystems

- To facilitate social science consultation in ecosystem research projects, the PSW Station initiated a process for placing a social science consultant in Redding, California.

Future Plans

The work accomplished by the PNW and PSW Research Stations in FY94 represents the beginning of a major new way of doing business under "ecosystem management." As such, it has provided an essential focal point for integrated research, development, and application activities involving scientists, land managers, and the public. In our estimation of the tangible results and the new relationships generated, significant progress was made toward implementing ecosystem management in the PNW. In FY 1995 and beyond, the stations and their collaborators plan an aggressive set of projects to accelerate this progress.

FY1995 funding for the program is $6.8 mm, which includes $1.5mm to be redirected from other programs within the two stations. The $6.8mm funding level compares to $5.6mm in FY1994. While the FY1995 appropriation is far short of the original funding request of $27.1mm for research , a great deal of high priority work is planned. This will greatly facilitate effective implementation of ecosystem management in the region.

In FY 1995, we will continue work within the five component areas outlined in this report. Within each of the five components, there will be four standard strategic activities:

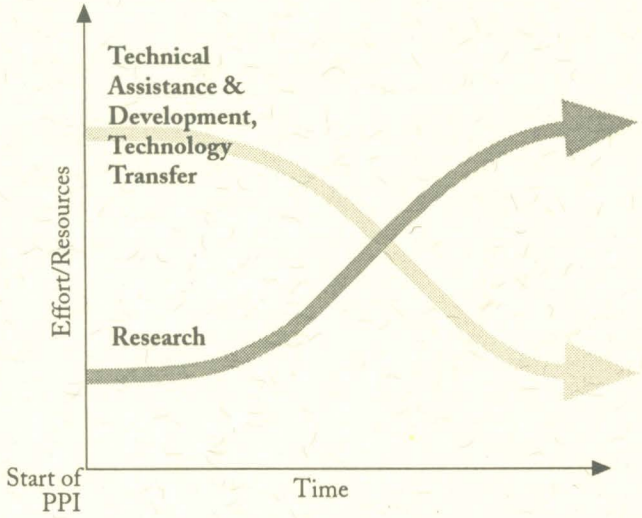
Technical Assistance. Scientific and technical assistance to support management activities.

Technology Transfer. Development and evaluation of training, workshops, and forums for land managers and the public to acquire needed skills and knowledge, and to facilitate mutual learning.

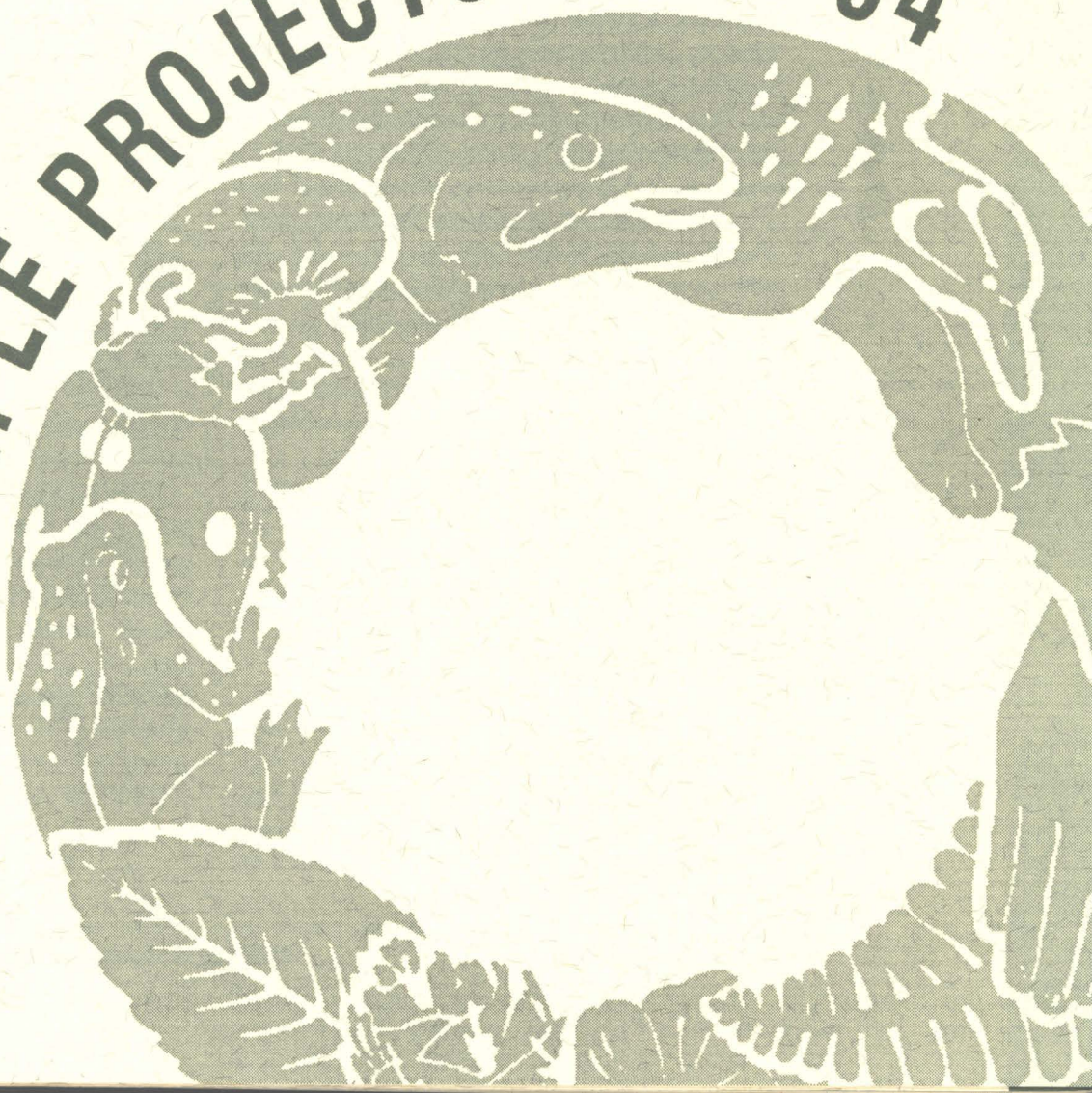
Technology Development. Development of syntheses of current information, design and testing of protocols, development of propositions, development and testing of tools, and demonstrations.

Research Generation of new knowledge, filling critical scientific gaps.

Over time, the program's emphasis will shift from predominantly technical assistance, technology transfer, and development work to added research to generate new knowledge essential to ecosystem management implementation, as shown in the following diagram.



SAMPLE PROJECTS IN FY'94



Building Bridges Across Agency Boundaries

The U.S. Forest Service is presently dealing with a number of forces for change: increasing court challenges, a reducing workforce, declining budgets, increasing public visibility, shifting biological and management theories, and increasingly diverse public values— these, of course do not exhaust the list.

One strategy which can help the organization adjust to these multitude of changes is to create better relationships with outside groups and organizations. These "bridging relationships" can help the Forest Service acquire better information, create better management strategies and decisions, build public support, and accomplish work on federal lands and in surrounding communities.

University of Michigan Professors Julia Wondolleck and Steven Yaffee have looked at over 200 examples of successful bridging activities across the nation to address some key questions:

- What is success? How is it defined in the minds of the agency and nonagency people involved in these examples?
- What elements of these situations make success possible?
- What barriers were encountered?
- What lessons can be learned to enhance future bridging projects?

The authors identified a large array of successful bridging activities. Cases were categorized into twelve types of activities. Within these categories, participants perceived success to be defined by **process** as well as **products.** Process changes integral to success included:

- processes which were carried out in a more cooperative and integrative way than the norm
- processes which encouraged mutual understanding of interests and issues among all parties, including the agency
- processes which promoted positive contacts between the agency and external parties

Elements of successful products included those that:

- lead to improved management on the ground
- provided a valued public service, such as rural economic development
- expanded limited resources to accomplish work
- fostered public ownership and support
- promoted trust of the Forest Service in general

In addition to describing a host of specific actions which would better enable employees to create successful bridging activities, the Wondolleck/Yaffee report provides a set of "role models" to help agency personnel explore a broad range of possible relationships. These "teaching stories" reflect the whole spectrum of models analyzed in the study.

Fire and Landscape Dynamics in the Klamath Mountains

In their attempts to describe current ecosystem conditions and evaluate ecosystem health, scientists and land managers will be limited to conjecture as long as our knowledge of baseline fire and landscape dynamics remains deficient. We must understand better how forest ecosystems developed and functioned prior to broad scale fire suppression and logging activities.

Recurring fire had an integral role in determining the species composition, stand structures, and landscape mosaics of most forest types in western North America prior to recent large-scale human intervention. The basic parameters of fire regimes that shaped forested ecosystems, such as fire frequency, fire severity, fire size, and fire spatial patterns, are poorly known for California forest types. This lack of knowledge is especially apparent for the Klamath Mountains.

To fill some of these information gaps, Alan H. Taylor of Pennsylvania State University and Carl N. Skinner of the Pacific Southwest Research Station have developed a fire and landscape dynamics study. The objectives of the project are to:

- Describe the prehistoric fire regime for the last 250-500 years at a variety of scales within the chosen landscape.

- Explore the relationships between the fire regime and the landscape patterns of stand structure, species composition, tree age classes, etc. as they would describe the range of natural variation over time.

- Provide a workshop to train local managers to collect and process data necessary to conduct a fire history study. This will equip them with the expertise to augment data developed in this study and adapt the information to local conditions.

A project area of approximately 10,000-20,000 acres was located that includes landscape conditions representative of much larger areas within the watershed. On the project area, an irregular grid of sample points was established to record stand structure, species composition, age class, and fire history data. In addition to these data, fire history data is be gathered from an intensive spatial sampling of stump slabs analyzed in the laboratory. This provides an accurate reconstruction of dates and season of fire events over the period represented by the age of the trees. The above data is then used to develop fire return intervals as well as the spatial relations of fire and the variation of landscape patterns over time.

Field work for the current study began in FY94. The study landscape was established, aerial photo interpretation to establish network of sample plots was completed and sampling was begun. In FY95 field sampling will be completed and preliminary interpretation of fire return intervals will be made. Workshop for fire history reconstruction will be provided. Final results of fire return intervals will be made available in early FY96.

Marbled Murrelet Conservation Assessment

The marbled murrelet is a widespread member of the auk family that breeds along the coasts of the North Pacific. While fairly abundant in many portions of its range, little has been known about it until recently. This is due in part to its habitat. Unique among auks, murrelets nest in trees, often far inland from the ocean. Inland, murrelets are detected primarily in forest stands with old-growth characteristics, located mostly within 60 km of the coast. Nests have been found in old-growth trees of a variety of species, often with moss and other platforms.

The total North American population of marbled murrelets is estimated to be 360,000 individuals. Approximately 85 percent of this population breeds along the coast of Alaska. Estimates for Washington, Oregon and California vary between 16,000 and 35,000 murrelets. In recent decades the marbled murrelet population in Alaska and British Columbia has suffered a marked decline. Trends in Washington, Oregon, and California also are down, but the extent of the decrease is not known. Current data suggests an annual decline of at least 4-6 percent throughout the species range.

Concern over this trend and the present low population levels led the U.S. Fish and Wildlife Service to list as "threatened" marbled murrelet populations occurring in Washington, Oregon and California, on September 28, 1992. Because of its life history characteristics, threats to the marbled murrelet include logging of old-growth forests, oil spills, and fishing nets.

The goal of the land management agencies in range of the murrelet is to develop a strategy that will permit the species to recover to the point of long-term persistence. The first step in developing a recovery plan is to assess the species' current status, threats to its viability, and opportunities for conservation. To this end, a marbled murrelet conservation assessment is being conducted through a collaborative interagency organization involving both the PSW and PNW Research Stations, federal and state land managers, and university scientists. This assessment has been designed to:

- Consolidate the available information concerning marbled murrelet ecology and current habitat conditions, including a summary of the life history traits that put the species at potential risk, and a more accurate estimate of the current population size and trends

- Determine the effort and costs necessary to evaluate the species long-term viability throughout its range.

- Outline the actions necessary to maintain viable populations of the species throughout its range.

A comprehensive report entitled *Ecology and Conservation of the Marbled Murrelet in North America* will be printed and distributed by January 1, 1995.

Interagency Watershed Analysis Center

President Clinton's Forest Plan calls for new approaches to land management along with a fundamental rethinking of how government agencies interact. A central component of the vision set forth in the plan is the development of shared institutional environments which foster collaboration and mutual learning. This is the philosophy upon which the Interagency Watershed Analysis Center was founded. Located at the Humboldt Nursery facility in McKinleyville, California, the center concentrates the best expertise in watershed and ecological sciences to develop and test the process of watershed analysis. The center also provides a shared GIS facility to consolidate hardware and technical expertise. In this way, the watershed analyses that are required by the President's Forest Plan can be accomplished collaboratively, efficiently, and effectively. The formal objectives of the center are to:

- Provide a shared institutional environment for developing Watershed Analysis based on collaboration and mutual learning.
- Provide an interdisciplinary, interagency center for expertise in watershed and ecological sciences.
- Concentrate limited staffing and resources among land management and regulatory agencies, such that interagency cooperation is facilitated.
- Efficiently complete the Watershed Analyses required by the President's Forest Plan.
- Provide for transfer of the science, technology, and art of watershed analysis to land managers.

The Center is managed by an interagency board of directors composed initially of the forest supervisor for the Six Rivers National Forest, a PSW station scientist, and the area manager for the Bureau of Land Management. As agreements are completed, this board will be expanded to include the National Park Service, National Marine Fisheries Service, Fish and Wildlife Service, and Environmental Protection Agency. Other agencies may be added as appropriate.

The center currently is completing three pilot watershed analyses: Pilot Creek in the Six Rivers National Forest, Bear Creek in the BLM Arcata Area, and Redwood Creek in the Redwood National Forest. Several other analyses are also underway.

In addition, the center has be transferring the science, technology, and art of watershed analysis to land managers and watershed analysis practitioners. To date, the center has conducted six in-depth technical workshops on topics critical to implementing the President's Plan. Each workshop was limited to 50 specialists selected from a wide range of disciplines from federal, state, and local government, and private agencies. Following each workshop, an extensive discussion paper was produced that incorporates and expands on ideas discussed at the workshop. These discussion papers have been distributed widely to provoke broad discussion within and between disciplines and agencies.

Restoration Research

The President's Northwest Forest Plan includes a variety of ecosystem management practices intended to restore ecological functions of forests, rivers, and riparian zones. Research is needed to test and refine restoration practices so that they can be effective and efficient. Funding for implementation of the President's Plan supports a number of critical research and monitoring activities that will provide information needed in development of restoration practices. Following are brief descriptions of several such projects:

Young stand thinning and diversity studies on the Willamette and Olympic National Forests involve commercial thinning in conjunction with a variety of silvicultural designs intended to provide different mixes of biological diversity values and wood product yield. Ecological and economic effects of these treatments are being examined. Information from these replicated, scientific studies will guide determination of socially acceptable approaches to management of plantations (areas of previous harvest) in various land use designations within the President's Plan.

Two studies are underway to evaluate ecological and economic effects of stream habitat restoration projects in the Willamette National Forest. These studies examine the common and expensive practice of placing logs in streams to improve fish habitat where logs have been removed intentionally or inadvertently by management activities. Designs intended to minimize cost for maximum ecological payoff are being tested.

A study in southwest Oregon is evaluating the development and maintenance of old-growth forest ecosystems. The study involves retrospective recreation of the developmental pathways of old-growth forests across a range of sites, including a close examination of disturbance patterns and frequency, species composition, soil characteristics, stand dynamics and ecological processes. The study makes a significant scientific contribution to our understanding of the many important links and ecological processes necessary to sustain old-growth ecosystems and meet late successional habitat objectives in the President's Plan.

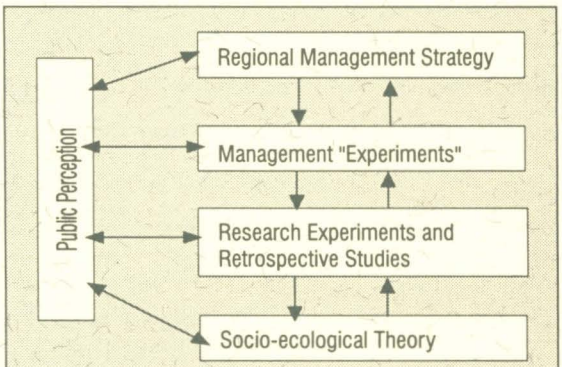
Demonstration of Ecosystem Management Options (DEMO) Studies on the Gifford Pinchot and Umpqua National Forests involve testing forest management strategies using widely different approaches. Most previous forest management research has focused on wood production; while most basic ecology and wildlife research has occurred in unmanaged stands. As a result, we need information about a range of intermediate management options. DEMO compares a range of harvest patterns and intensities in a rigorous design replicated in eight locations in Oregon and Washington. Response of wildlife, vegetation, economics, social acceptance, hydrology and special forest products is emphasized. Harvest patterns and intensities test specific recommendations in the President's Plan and is essential to implementing the plan with confidence.

Planning for Adaptive Management

Management and research can be designed to bridge the gap between management strategies and scientific theory. Using this concept, a PNW decision support team has been working to identify a philosophy and approach to adaptive management. The "bridging" process that they developed includes ranking future decisions and designing management and research experiments and retrospective studies to provide information to improve those decisions.

The adaptive management planning process can be illustrated using a hypothetical strategy designed to mimic natural disturbance patterns and processes in coastal Alaska. Scientists theorize that wind is the predominant natural disturbance agent for most productive ecosystems in coastal Alaska. Disturbance patterns are thought to strongly influence biological diversity by influencing the amount and distribution of habitat. Disturbance is also thought to influence productivity by rejuvenating soils. Management and research experiments and studies can help test these theories and improve management strategies over time.

Such a "management experiment" might include varying the soil area disturbed by windthrow (e.g., 0, 30, 60 %). More controlled, smaller-scale, shorter-term "research" experiments could tease apart the complexities in the management experiments and allow us to monitor responses in greater detail. Research experiments might include artificially constructed soils with no disturbance, complete disturbance, and disturbance with and without mounding. Retrospective studies could be used to evaluate soil and ecosystem development across a wide range of space and time, for example by comparing soil, vegetation, and small-ranging animal habitat on adjacent stands or watersheds with widely differing windthrow histories. An important role for research and public participation is to develop new hypotheses to be tested in future management experiments.



Bridging the gap between management objectives and strategies and scientifc theory

Monitoring intensity would increase from management to research experiments. Criteria are needed, for example, for deciding about whether to continue the focus on windthrow disturbance. If windthrow is consistently found to alter monitored variables like ecosystem productivity or habitat quality in a way that maintains long-term ecosystem productivity or animal habitat, then keeping the strategy is warranted. If other factors such as species composition, insects, or disease seem to control ecosystem productivity, the basic strategy should be altered. Determining what "consistency" means for these results is an important question that must be addressed in a new area of research, the statistics of adaptive management.

For More Information

We extend to you an invitation to learn more about research programs to support implementation of the President's Forest Plan. For more detailed information about projects mentioned in this report or other related programs of the Forest Service Pacific Northwest and Pacific Southwest Research Stations, contact:

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